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Performance Oriented Packaging Testing of OTTO Fuel Drum for Packing Group II Liquid Hazardous Materials

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6. AUTHOR(S)

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13. ABSTRACT (Maximum 200 words)

This Performance Oriented Packaging (POP) test was conducted to ascertain whether the OTTO Fuel Drum (Drawing #5012852) meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 106 through 178, dated 1 October 1992. The packaged commodity used for the test was a simulated liquid fuel weighing 244 kg (537 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 7 kg (15 pounds) were added. Gross weight of the loaded drum was 278 kg (611 pounds). The test results indicate that the drum has conformed to the POP requirements.

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DODPOPHM/USA/DOD/NADTR93005

PERFORMANCE ORIENTED PACKAGING TESTING OF OTTO FUEL DRUM FOR PACKING GROUP II LIQUID HAZARDOUS MATERIALS

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May 1993

FINAL

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INTRODUCTION

This Performance Oriented Packaging (POP) test was performed to ascertain whether the OTTO Fuel Drum (Drawing #5012852) meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 106 through 178, dated 1 October 1992. The packaged commodity used for the test was a simulated liquid fuel weighing 244 kg (537 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 7 kg (15 pounds) were added. Gross weight of the loaded drum was 278 kg (611 pounds). Six drums were used for testing. The drums were identified as #1 through #6.

TESTS PERFORMED

1. Base Level Vibration Test

This test was performed in accordance with Title 49 CFR 178.608. Drums #1, #2, and #3 were placed on a repetitive shock platform which has a vertical linear motion of 1-inch double amplitude. Movement of the drums were restricted during vibration in all but the vertical direction. The frequency of the platform was increased until the drums left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour.

2. Stacking Test

This test was performed in accordance with Title 49 CFR 178.606. Drums #4, #5, and #6 were used for this test. Each drum was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a minimum height of 3 meters (including the test drum). A weight of 832 kg (1,833 pounds) was stacked on each test drum. The test was performed for 24 hours. The weight was then removed and the drums examined.

3. Drop Test

This test was performed in accordance with Title 49 CFR 178.603. Six drops were performed from a height of 1.2 meters (4 feet) in the following orientations (three drops for each orientation):

a. Horizontally using drum #1, #2, and #3.

b. Diagonally on the edge between the cover assembly and the top ring of the drum using drum #4, #5, and #6.

NOTE

The leakproofness test and the hydrostatic test were performed by Associated Testing Laboratories of Wayne, New Jersey. Test Report T28874-001 contains the results collected during qualification testing.

4. Leakproofness Test

The test was performed in accordance with Title 49 CFR 178.604. Two specimens were pressurized to 3 psi and observed for leakage.

5. Hydrostatic Pressure Test

The test was performed in accordance with Title 49 CFR 178.605. Two specimens were pressurized to 15 psi for a period of 30 minutes. The drums were observed for leakage.

PASS/FAIL

1. Base Level Vibration Test

The criteria for passing the base level vibration test is outlined in Title 49 CFR 178.608(c): No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength and there shall be no rupture or leakage of any of the packages

2. Stacking Test

The criteria for passing the stacking test is outlined in Title 49 CFR 178.606(d): No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation and there shall be no leakage of the filling substance from the inner receptacle.

3. Drop Test

The criteria for passing the drop test is outlined in Title 49 CFR 178.603(f): A package is considered to successfully pass the drop tests if for each sample tested, there is no damage to the outer packaging likely to adversely affect safety during transport, and no leakage of the filling substance from the inner packaging.

4. Leakproofness Test

The criteria for passing the leakproofness test is outlined in Title 49 CFR 178.604(f): No test sample should leak air from the packaging.

5. Hydrostatic Pressure Test

The criteria for passing the hydrostatic pressure test is outlined in Title 49 CFR 178.605(e): No test sample should leak liquid from the package.

TEST RESULTS

1. Base Level Vibration Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Drop Test

Satisfactory.

4. Leakproofness Test

Satisfactory.

5. Hydrostatic Pressure Test

Satisfactory.

DISCUSSION

1. Base Level Vibration Test

The input vibration frequency was 3.6 Hz. Immediately after the vibration test was completed, each drum was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

2. Stacking Test

Each drum was inspected after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

3. Drop Test

After each drop, the drums were inspected. The inner liquid was completely retained by the drum.

4. Leakproofness Test

During the test, each drum was inspected and found to have no air leakage.

5. Hydrostatic Pressure Test

After the test, each drum was inspected and found to have no liquid leakage.

REFERENCE MATERIAL

A. Code of Federal Regulations, Title 49 CFR, Parts 106-178.

B. Bureau of Explosives Tariff No. BOE 6000K Hazardous Materials Regulations of the Department of Transportation by Air, Rail, Highway, Water including Specifications for Shipping Containers.

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Crane, IN 47522-5000

TEST DATA SHEET

POP MARKING: UN 6HA1/Y1.2/100/**/USA/DOD/NAD/1.2MM **YEAR LAST PACKED OR MANUFACTURED	
Nomenclature: OTTO Fuel Drum	
Type: 6HA1	**NSN:** 8140-01-054-6702
Drawing Number or P/N: NAVSEA Drawing 5012852	**Outer Packaging Material:** Steel Drum
Dimensions: 24-1/8" Dia x 35-9/16" H	**Gross Weight:** 278 kg (611 pounds)
Closure (Method/Type): Locking Ring	**Tare Weight:** 27 kg (59 pounds)
Additional Description: Inner Plastic Receptacle	
PACKAGED COMMODITY:	
Nomenclature: See table 1	**NSN(s):** See table 1
United Nations Number: See table 1	
United Nations Packing Group: II	
Physical State (Solid, Liquid, or Gas): Liquid	
Vapor Pressure (Liquids Only): N/A **At 50 °C:** 0.7323 mm Hg **At 65 °C:** 1.9260 mm Hg	
Consistency/Viscosity: 4.04 cP	**Density/Specific Gravity:** 1.232
Amount per Package: See table 1	**Flash Point:** 265 °F
Net Weight: See table 1	
PACKAGED COMMODITY USED FOR TEST:	
Name: Calcium Chloride	**Physical State:** Liquid
Consistency: Liquid	**Density/Specific Gravity:** 1.23
Test Pressure (Liquids Only): 1 atm	**Net Weight:** 251 kg (552 pounds)
Additional Description: The net weight includes the current maximum commodity weight plus an additional 7 kg (15 pounds).	

N/A = Not Applicable

TABLE 1
Commodities Approved for Shipping in the OTTO Fuel Drum

NALC/ DODIC	NSN	Commodity Nomenclature	Packing Document Number	Haz Class/Div	UN* Number	Capacity L (gal)	Total Net Weight kg (lb)	Total Gross Weight kg (lb)
N/A	1356-01-054-6701	OTTO Fuel II	3345AS100	9 or 6.1	3082 or 2810	197 (52)	244 (537)	271 (596)

N/A = Not Assigned

*As of date of testing, UN Number has not been assigned. However, Packing Group II Test Criteria would apply/certify either UN number.